

FINAL STATEMENT OF REASONS
22 CALIFORNIA CODE OF REGULATIONS

Establishment of Specific Regulatory Levels Posing No Significant Risk for:
Arsenic, Butylated hydroxyanisole, Cadmium, Chromium (hexavalent compounds).

Amendment to:

Section 12705. Specific Regulatory Levels Posing No Significant Risk.
Section 12709. Exposure to Trace Elements.
Section 12711. Levels Based on State or Federal Standards.

The Safe Drinking Water and Toxic Enforcement Act of 1986 (hereinafter the Act) prohibits a person in the course of doing business from knowingly and intentionally exposing any individual to a chemical that has been listed as known to the State to cause cancer or reproductive toxicity without first giving clear and reasonable warning to such individual (Health and Safety Code Section 25249.6). The Act also prohibits a business from knowingly discharging a listed chemical into water or onto or into land where such chemical passes or probably will pass into a source of drinking water (Health and Safety Code Section 25249.5).

For chemicals known to the state to cause cancer, an exemption is provided by the Act for exposures which the person can show to pose no significant risk (Health and Safety Code Sections 25249.10). A determination that a level of exposure poses no significant risk can be made utilizing existing regulations (Section 12701 to 12721, Title 22, California Code of Regulations). (Unless otherwise indicated, all section references are to Title 22, California Code of Regulations.)

Section 12701 describes alternative methods for making such a determination. One such method is through the application of the specific regulatory level established for the chemical in question in Section 12705. Section 12705 supersedes Section 12709 (Exposure to Trace Elements), Section 12711 (Levels Based on State or Federal Standards), and Section 12713 (Exposure to Food, Drugs, Cosmetics and Medical Devices).

Procedural Background

On April 10, 1992, the Office of Environmental Health Hazard Assessment (OEHHA) issued a notice of proposed rulemaking advising that the agency intends to adopt "no significant risk" levels in Section 12705 for arsenic, butylated hydroxyanisole (BHA), cadmium and chromium (hexavalent compounds). The proposal would also conform other regulations (Section 12709 and 12711) by deleting references to these chemicals. Pursuant to such notice, on May 29, 1992, a public hearing was held to receive public comments on the proposed regulation. No written or oral comment regarding this rulemaking was received.

Purpose of Final Statement of Reasons

This final statement of reasons sets forth the reasons for the final regulation adopted by OEHHA for Section 12705, and responds to the objections and recommendations submitted regarding the regulation. Government Code Section 11346.7, subsection (b)(3) requires that the final statement of reasons submitted with an amended or adopted regulation contain a summary of each

objection or recommendation made regarding the adoption or amendment, together with an explanation of how the proposed action has been changed to accommodate each objection or recommendation, or the reasons for making no change. It specifically provides that this requirement applies only to objections or recommendations specifically directed at the proposed action or to the procedures followed in proposing or adopting the action.

No objections or recommendations relating to this rulemaking were received.

Specific Findings

Throughout the adoption process of this regulation, OEHHA has considered the alternatives available to determine which would be more effective in carrying out the purpose for which the regulation was proposed, or would be as effective and less burdensome to affected private persons than the proposed regulation. OEHHA has determined that no alternative considered would be more effective than, or as effective and less burdensome to affected persons than, the adopted regulation.

OEHHA has determined that the regulation imposes no mandate on local agencies or school districts.

Rulemaking File

The rulemaking file submitted with the final regulation and this final statement of reasons is the complete rulemaking file for this amendment to Section 12705, 12709 and 12711.

Necessity for Adoption of Regulations

For chemicals known to the State to cause cancer, the Act exempts discharges, releases and exposures which, making certain assumptions, pose no significant risk. The Act specifies that any claim of exemption under Health and Safety Code Section 25249.10, subsection (c), must be based upon evidence and standards of comparable scientific validity to the evidence and standards which form the scientific basis for the listing of the chemical. However, the Act does not further clarify when a chemical risk is not significant, nor specify levels of chemical exposures posing no significant risk. Existing regulations describe methods for calculating levels which pose no significant risk.

The purpose of this regulation is to provide "safe harbor" no significant risk levels for arsenic, BHA, cadmium and chromium (hexavalent compound), below which the Act does not apply. These levels will allow persons to determine whether a discharge, release or exposure involving these chemicals is exempt from the provisions of the Act.

Although existing regulations describe principles and assumptions for conducting risk assessments to calculate the no significant risk levels, most businesses subject to the Act do not have the resources to perform these assessments. Yet each business with ten or more employees needs the ability to determine whether its activities or products are subject to the prohibitions of the Act. In the absence of a regulatory level, some businesses subject to the Act -- as well as persons seeking to enforce violations of the Act -- would not have a way of

determining compliance, without investing their own resources to conduct a risk assessment.

Section 12705

This regulation adopts "no significant risk" levels in Section 12705, subsection (b), for the following chemicals:

Arsenic	0.06 microgram per day (inhalation)
Butylated hydroxyanisole (BHA)	4000 micrograms per day
Cadmium	0.05 microgram per day (inhalation)
Chromium (hexavalent compounds)	0.001 microgram per day (inhalation)

A level established for a carcinogen in Section 12705 supersedes any existing level for that carcinogen in Section 12709 or 12711. Specific regulatory levels currently exist for arsenic and cadmium in Section 12709, and for chromium (hexavalent compounds) in Section 12711.

In order to minimize potential confusion, this rulemaking action seeks to add the new levels to Section 12705, while simultaneously deleting the levels for hexavalent chromium from Section 12711, and the level for cadmium from Section 12709. This rulemaking will also amend Section 12709 to provide that the existing no significant risk level for arsenic (10 micrograms per day) is not applicable to exposures via inhalation. The level for arsenic in Section 12709 remains available for exposures to the chemical as a trace element through routes other than inhalation. In contrast, the level for cadmium is deleted from Section 12709, as it has previously been determined that exposures to cadmium pose no significant risk by the route of ingestion (Section 12707).

The levels represent the level of exposure to the chemical which is calculated to result in no more than one excess case of cancer in an exposed population of 100,000, assuming exposure over a 70-year lifetime (10^{-5} lifetime risk of cancer), and are based on the following risk assessment documents, which were either prepared following the principles in Section 12703, or reviewed for consistency with such principles, by the Reproductive and Cancer Hazard Assessment Section (RCHAS) of the Office of Environmental Health Hazard Assessment.

"Health Effects of Inorganic Arsenic Compounds" (Part B of the "Report to the Air Resources Board on Inorganic Arsenic"), California Department of Health Services, March 23, 1990.

"Risk Specific Intake Levels for the Proposition 65 Carcinogen, Cadmium, California Department of Health Services, November 1990.

"Risk Specific Intake Levels for Inhalation Exposures of the Proposition 65 Carcinogen, Chromium VI (Hexavalent Chromium)," California Department of Health Services, November 1990.

Memorandum to Steven A. Book, Ph.D., Chief, Health Hazard Assessment Division, from Lauren Zeise, Ph.D., Acting Chief, Reproductive and Cancer Hazard Assessment Section, re: Risk Specific Intake Level for BHA, December 19, 1990.

These documents are summarized as follows:

Arsenic

An epidemiologic study of respiratory cancer mortality among workers employed at a copper smelter in Tacoma, Washington was determined to be the best study available for potency evaluation in terms of ascertainment of exposure, size of the study population and person years of follow-up. Based on data from this study, DHS concluded the best estimate of the upper bound unit risk to be 3.3×10^{-3} per microgram/ m^3 ($\mu g/m^3$). Using standard assumptions (20 m^3 of air inhaled per day, and a body weight of 70 kilograms), this corresponds to a cancer potency estimate of $12 (mg/kg-day)^{-1}$.

Potency estimates derived by DHS and the U.S. Environmental Protection Agency (EPA) from other epidemiologic studies with reasonably good dose response data ranged from 0.8 to 6.8×10^{-3} per $\mu g/m^3$ (2.8 to $24 (mg/kg-day)^{-1}$). (EPA's derivation of cancer potency estimates is described in the DHS risk assessment.

DHS recommends that the potency value of $12 (mg/kg-day)^{-1}$ be used to estimate risk specific intake levels from exposure to inhaled arsenic. This value falls within the range of estimates derived by DHS and EPA, and is the upper 95% confidence bound estimate from the analysis of human data which DHS considered as the most reliable for this purpose. For this potency value, the intake associated with a 10^{-5} risk of cancer from inhaled inorganic arsenic is $0.06 \mu g/day$.

Pursuant to Section 12705(c), which requires the lead agency to provide an opportunity for the Scientific Advisory Panel to review and comment on any proposed no significant risk level, the proposed level for arsenic and the risk assessment document which provides the basis for this level were submitted to the Scientific Advisory Panel on October 19, 1990. No panelists presented specific recommendations on, or objections to, the proposed level.

Butylated hydroxyanisole

Currently available data on butylated hydroxyanisole (BHA) suggest two mechanisms for the carcinogenicity of the chemical: (1) BHA's carcinogenicity is mediated by an epigenetic mechanism, e.g., it increases tumor incidence in part by stimulating cellular proliferation; and (2) BHA is an initiator or a genotoxic agent. Considering these hypotheses on BHA's carcinogenicity, the Reproductive and Cancer Hazard Assessment Section (RCHAS) calculated no significant risk levels using two different methods: (1) the linearized multistage polynomial model; and (2) an "uncertainty factor" method. In both instances, data obtained from a study which showed a dose-dependent increase of BHA-induced carcinomas in the forestomach of Fischer 344 rats were used. While this study is not the most sensitive, it provides the best information on dose response at lower dose levels.

Using the dose-response data on the induction of forestomach lesions from the rat study selected, the human cancer potency was calculated to be $4.4 \times 10^{-5} (mg/kg-day)^{-1}$ for combined papillomas and carcinomas, and $2 \times 10^{-4} (mg/kg-day)^{-1}$ for carcinomas alone. The doses of BHA associated with a lifetime cancer risk of 10^{-5} for a 70 kilogram adult are calculated to be $1.6 mg/day$ and $3.5 mg/day$.

If, however, the carcinogenesis of BHA may be mediated by an epigenetic mechanism, the linearized multistage polynomial model may not be suitable for estimating the cancer potency of BHA. Because the data are not adequate to define a specific model for epigenetic carcinogenesis, RCHAS estimated allowable doses by using an "uncertainty factor" method.

Forestomach hyperplasia (an appropriate marker for cell proliferation in a lifetime animal study) was the toxicity endpoint used for the risk assessment. The no observed effect level (NOEL) from the Fischer F344 rat study was identified as 54.8 mg/kg-day. By applying an uncertainty factor of 1000, RCHAS calculates an intake level of BHA of 45.8 micrograms/kg-day, or 3.8 mg/day for a 70-kilogram human adult. The uncertainty factor of 1000 includes a factor of 10 to account for interspecies variability, a factor of 10 for intraspecies variation, and an additional factor of 10 for the carcinogenicity.

Using either the linearized multistage polynomial model or the uncertainty factor method, a no significant risk level of 4 mg/day (4,000 μ g/day) was determined to be a reasonable no significant risk level for BHA.

Pursuant to Section 12705(c), which requires the lead agency to provide an opportunity for the Scientific Advisory Panel to review and comment on any proposed no significant risk level, the proposed level for BHA and the risk assessment document which provides the basis for this level were submitted to the Scientific Advisory Panel on April 26, 1991. No panelists presented specific recommendations on, or objections to, the proposed level.

Cadmium

Data obtained from an occupational mortality study of workers exposed for at least six months to cadmium dust in a Colorado cadmium production plant was used to estimate a cancer potency factor for the inhalation of cadmium.

A relative risk model was used to fit the data obtained from this study. A least squares estimate (LSE) and a 95% upper confidence limit (UCL) estimate of unit risk were calculated for the exposed workers. These estimates were used, in turn, to calculate cancer risks for the California population using statistics on mortality and respiratory cancer incidence in California. The resulting LSE was 1.6×10^{-6} per nanogram/ m^3 (ng/ m^3), and the 95% UCL was 4.1×10^{-6} per ng/ m^3 . DHS recommends that the latter cancer potency be used for estimating risk. At this potency, the concentration of airborne cadmium associated with a 10^{-5} risk of cancer is 2.4 ng/ m^3 , and the intake level of airborne cadmium is 50 ng/day, or 0.05 μ g/day.

Pursuant to Section 12705(c), which requires the lead agency to provide an opportunity for the Scientific Advisory Panel to review and comment on any proposed no significant risk level, the proposed level for cadmium and the draft risk assessment document which provides the basis for this level were submitted to the Scientific Advisory Panel on September 16, 1988. This meeting was the first opportunity for the panel to review risk assessments for a number of listed chemicals, and resulted in many general comments on the risk assessment procedure. Some panelists had comments and suggestions regarding the content of the risk assessment document. However, no objections to, or recommendations on the no significant risk level were presented.

The risk assessment document was revised to address some of the panel's concerns.

Chromium

Data from an epidemiologic study of lung cancer incidence among workers at a chromate manufacturing plant in Ohio and from an industrial hygiene survey in 1948 were used to estimate the carcinogenic potency of inhaled hexavalent chromium. A linear relationship was assumed between risk and dose to estimate cancer potency. Using this general approach, DHS derived a number of best estimates as well as statistical upper confidence bounds on potency. Assuming that 14% of the chromium inhaled by the workers was in the hexavalent form, the plausible 95% upper confidence limit based on carcinogenic potency was estimated to be $146 \times 10^{-6} (\text{ng}/\text{m}^3)^{-1}$. DHS recommends that this potency be used for estimating risks from respiratory exposure to hexavalent chromium under this assumption. The air concentration associated with a 10^{-5} risk of cancer is $0.07 \text{ ng}/\text{m}^3$, and the corresponding intake level by inhalation is $1 \text{ ng}/\text{day}$, or $0.001 \text{ } \mu\text{g}/\text{day}$.

Pursuant to Section 12705(c), which requires the lead agency to provide an opportunity for the Scientific Advisory Panel to review and comment on any proposed no significant risk level, the proposed level for chromium and the draft risk assessment document which provides the basis for this level were submitted to the Scientific Advisory Panel on September 16, 1988. This meeting was the first opportunity for the panel to review risk assessments for a number of listed chemicals, and resulted in many general comments on the risk assessment procedure. Some panelists had comments and suggestions regarding the content of the risk assessment document. However, no objections to, or recommendations on the no significant risk level were presented.

The risk assessment document was revised to address some of the panel's concerns.